ence light is reflected by a mirror **7**, further reflected by a mirror **8**, and then reflected by the half-mirror **5**. The reference light reflected by the half-mirror **5** and the sample light transmitted through the half-mirror **5** propagate in the same direction and are thereby synthesized (referred to as the "interference light") and thereafter detected by the photodetector **6**.

[0041] A vibrating element that vibrates the mirror **7** to apply modulation to the reference light is mounted on the mirror **7**. By the vibration of the vibrating element, the mirror **7** is made to vibrate sinusoidally at a predetermined amplitude and frequency. The vibrating element may, for example, be arranged from a piezoelectric transducer (PZT).

[0042] The interference light of the reference light and the scattered light made incident on the half-mirror **5** is made incident on the photodetector **6** and from an output signal of the photodetector **6**, a power spectrum of the interference intensity of the light is detected by a spectrum analyzer **31**. This spectrum is referred to as the "heterodyne spectrum."

[0043] By observing the waveform (peak frequency, halfwidth, etc.) of the heterodyne spectrum, the electrophoretic mobility of the sample particles can be measured.

[0044] A procedure for calculating the electrophoretic mobility shall now be described using a flowchart (FIG. **2**). First, the sample solution, in which the sample particles are dispersed, is injected into the internal space **11** of the sample cell container C, and in a state where an electric field is not applied, the light amount of the laser diode is adjusted to a light amount appropriate for measurement by using light attenuators ND**1** and ND**2**, etc., that are inserted between the half-mirror **2** and the mirrors **3** and **7** (step S**1**). Vibration is then applied to the vibrating element and measurement of the light intensity (function of time) received by the photodetector **6** is performed (step S**2**). The measured light intensity expresses an "autocorrelation function" of the scattered light. The autocorrelation function is subject to Fourier transform analysis by the spectrum analyzer **31** to calculate and record the heterodyne spectrum (step S**3**).

[0045] Then using the movable stage **9**, the focal point of the sample light in the sample solution is moved and stopped at a predetermined position. As shall be described later using FIG. **3** and FIG. **4**, several points in the z-direction from an upper wall to a lower wall of the internal space **11** formed inside the sample cell container C are set as stop positions, and from among these several points, a single point (the z-coordinate of which shall be z**1**) at which measurement is to be made first is selected and the focal point is stopped at that position (step S**4**).

[0046] A predetermined DC field is then applied to the internal space **11** using the DC power supply **32** to make the sample particles electrophorese (step S**5**). The vibrating element is then vibrated to measure the autocorrelation function (step S**6**) and the heterodyne spectrum is measured and recorded by the spectrum analyzer **31** (step S**7**). In comparison to the heterodyne spectrum calculated in step S**3**, the present heterodyne spectrum is shifted in central frequency due to the osmotic flow generated by the movement of the sample particles. This shift Δf can be measured.

[0047] Thereafter, the measurement point is changed (z**1**→z**2**) and the procedure of steps S**5** to **7** is repeated (step S**8**). When measurements are ended for all measurement points (for example, z**1** to z**5**) that were set in advance, a set of heterodyne spectra can be plotted with the z-coordinate of the measurement point as the ordinate and the frequency as the abscissa as shown in FIG. **3** and FIG. **4**.

[0048] The frequency represented by the abscissa of each of the graphs of FIG. **3** and FIG. **4** corresponds to an apparent migration velocity of the sample particles. The apparent migration velocity is a sum of the true migration velocity of the sample particles based on the electric field and the electroosmotic flow velocity, and the electroosmotic flow velocity differs according to the z-coordinate of the measurement point as shall be described below. Therefore, by analyzing the velocity profile of the electroosmotic flow that differs according to the z-coordinate, a stationary plane at which the electroosmotic flow velocity is zero can be specified and the true migration velocity of the sample particles at the stationary plane can be determined.

[0049] Here, to describe the electroosmotic flow, the wall surfaces of the internal space inside the sample cell container are negatively charged. Positively charged ions and particles thus gather near the wall surfaces and when an electric field parallel to the wall surfaces is applied, a flow toward the negative electrode side occurs near the wall surfaces due to these ions and to compensate for this flow, a flow in the opposite direction occurs at a central portion of the internal space. This flow is the electroosmotic flow and there exists a plane that is located at a certain distance from a wall surface of the internal space and is a plane at which the electroosmotic flow velocity is zero. This plane is the stationary plane and the migration velocity of the sample particles at this stationary plane expresses the true migration velocity of the sample particles based on the electric field.

[0050] Based on a profile of the electroosmotic flow velocities that differ according to the z-coordinate, the z-coordinate of the stationary plane at which the electroosmotic flow velocity is zero is determined by the following calculation.

[0051] The following formula (1) holds because the apparent migration velocity is the sum of the true migration velocity of the sample particles based on the electric field and the electroosmotic flow velocity.

$$Uobs(z)=Up+Uosm(z) \tag{1}$$

[0052] z: distance from the center of the internal space
[0053] $U_{obs}(z)$: apparent migration velocity measured at the position z
[0054] U_p: true migration velocity of the particles
[0055] $U_{osm}(z)$: electroosmotic velocity at the position (z)
[0056] In a rectangular parallelepiped internal space, the apparent migration velocity $U_{obs}(z)$ can be approximated by the following second-order formula (2) regarding z.

$$U_{obs}(Z)=AU_0(z/b)^2+\Delta U_0(z/b)+(1-A)U_0+U_p \tag{2}$$

[0057] Here, the coefficient A is expressed by

$$A=1/[(2/3)-(0.420166/k)] \tag{3}$$

[0058] and k is a ratio of lengths a and b of respective sides of a cross section of the internal space perpendicular to the migration direction, that is, k=a/b (a>b). U_0 is an average value of flow velocities of the solution at the upper and lower wall surfaces and ΔU_0 is a difference of the flow velocities of the solution at the upper and lower wall surfaces of the cell.

[0059] The stationary plane is located at the position at which $U_{obs}=U_p$, and the migration velocity observed at the stationary plane is the true migration velocity of the particles. The true migration velocity U_p of the particles can be determined by measuring apparent migration velocities $U_{obs}(z)$ at various positions by moving the measurement point verti-